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NUTRITION RELATING TO EYE DISEASES*

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The following is written to help the Optometrist to a better understanding in the fundamentals of nutrition. The data given are believed reliable and are by Sherman L. Davis, Rubner, Voit, Funk, Hess, Quigley, and others.

It is hoped that this will help to form a better opinion in advising a diet in certain eye conditions.

A chemist named Casimer Funk, of Cambridge, England, tried to isolate substances from foods to cure certain diseases. These substances were called "Amins" and to distinguish such from others, he attached the prefix "Vita," meaning life. Hence the name "Vitamins."

Vitamin is defined in the dictionary as a substance of unknown composition existing in minute quantities in natural foods, and which are necessary to normal nutrition and growth, absence of which from the diet, causes various diseases.

Of course, when this term was coined, several of these substances were already known, but Professor Russel Chitterden, of Yale, in 1898, made a special study of the need of proteins in the diet and their relative merit derived from animal or vegetable sources.

Practically all of this dietary knowledge is a development of the twentieth century. Many of these experiments were carried out on rats.

A Japanese naval surgeon, Takaki, discovered the cause of the disease known as Beriberi, once a very prevalant disease among men of the Japanese navy and army.

Those affected had intense pains in arms or legs, a sort of neuritis leading to paralysis and death.

The disease did not resemble scurvy, but Dr. Takaki thought it might be due to some deficiency in the diet of fish and polished rice to

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which the men were limited. He changed the diet and the disease disappeared. Later it was shown that the thin hulls removed in polishing rice contained the substance which would have prevented the disease. Had the whole grain been used, the disease would not have occurred.

Sir Richard Hawkins wrote in the later part of the sixteenth century about ten thousand men who had been destroyed by scurvy in the twenty years he had been at sea.

John Hall, son-in-law of Shakespeare, published a book in 1657, called "Selected Observations on English Bodies or Cures, both Empirical and Historical." He made a brew of scurvy grass and water cress, which, however, did not gain in popularity.

Wm. Harvey, the great physician who first demonstrated the course of the circulation of the blood, recommended lemons for the prevention of scurvy, thinking the beneficial effects as coming from fruit acid. Later in 1747, Dr. James Lind, demonstrated that some peculiar quality in the fruit itself brought about a cure. Dr. Lind recommended that fruit juices be concentrated, bottled, and fed to sailors during a long cruise. It took more than one hundred years, before enough was known of the diet of sailors to add fruit juices to the regular diet saving many lives thereby.

Scurvy still exists today in people who try to live on diets of salted and dried meats, flour, and coffee, with no fresh or canned vegetables, fruits, or milk.

Infants are at the mercy of dietary judgment of their parents. Babies can cry for more, but not for better food.

The mysterious something in fruits or vegetables which is health giving is the mysterious "Vitamin," and which has been so widely advertised and often wrongly so. It is not intended herein to endorse any of the food fads or cults, which are largely unscientific or embrace at least only a part of the problems involved. Due to the large publicity and advertising of vitamins, imaginary discussions on special diets are the topic of most any informal dinner party.

Quite logically the conversation drifts to the discussion of the indigestibility of a midnight meal. The man on the right gravely expands on the subject of food incompatibilities.

"Lobster and milk at the same meal invariably leads to severe indigestion." It is a food always evaded by him. After delivering this profound dictum, he lapses into silence while he eats a "Lobster a la Newburg" before him, apparently oblivious of the fact that this dish is a mixture of lobster and milk. The man on the left says that the cause of most indigestion lies in the pernicious habit of drinking water during meals. Every one at the table nods agreeably, apparently blind to the fact that the exponent of this idea is consuming his second glass of iced tea.

A lady across the table has heard that carbohydrates and proteins should not be eaten at the same meal, she has no knowledge of the physiology of digestion, but she knows meat means proteins and wonders whether lobster is meat also. Playing safe, she sticks to carbohydrates, eating bread, happy in her ignorance, that this "staff of life" contains nearly half as much protein by weight than does meat.

Another lady turns the conversation to her favorite health advisor, unconsciously advertising his medical attainments, accordingly all diseases are due to some simple derangement, and as such is the case, painstaking diagnosis is unnecessary and therefore one treatment for all diseases. The quack usually tells them what they want to believe, just hypothetical delusions that flourish on human hopes. The quack does not say that he has no adequate medical training, that no hospital will give him a place on his staff, and the army or navy exclude him from their medical corps. The quack will say that optometrists and medical men refuse to accept ideas suggested by others. Nothing, however, is further from the truth as most of the newer ideas have been advocated by chemists, etc. Quackery has the same relation to a legitimate profession, that wildcat speculation has to reputable investments.

Many coming to us with various eye complaints are not aware of other bodily ailments or deficiencies and attribute all their eye discomforts to a pair of glasses not properly fitted, or hope to have some one sell them a pair, which automatically does away with all former discomforts. It is a well known fact that between the ages of 35 and 55 about 75% possess physical ailments of which they are unaware, that is, such ailments are brought to light because the eyes as part of a tissue suffering, has given an alarming notice first.

There is no road to health through fad or simple ritual which compensates for neglect or self indulgence.

We are forced to agree with the old Latin philosophers, that old age is a disease. As long as you retain your health you retain your youth. The menace of middle age is largely the beginning of old age, failing health, failing vigor of life. It is not a question of prolonging life often made miserable by diseases. It is a question of pushing back middle age and prolonging maturity.

This we can most effectively do by holding off chronic diseases, which gradually encroach normal body functions and especially the most valued of all senses, "eye sight."

There are two ways of living a long time in good health:

1. Choosing ancestors carefully, which of course is beyond our control. Inheritance is an inborn vitality and the best resistance of keeping chronic disorders away.
2. Careful living, especially eating the proper foods in proper quantities, and continual vigilance directed towards encroaching disease, especially in its early stages, so that advances of such may be arrested.

Some men or women break down very easily when confronted with mental or physical strain, while in others, it leaves them apparently unaffected.

Periodic eye examinations will help considerably in combating diseased conditions, while still in the repairable stage, and which are often recognized in a carefully conducted eye examination. Of course, no one likes to be told that his blood pressure is getting high, that his arteries are hardening, or that his kidneys are not functioning well, but denying facts does not alter them. It is only by facing them can we control them.

Diseases of the heart and blood vessels develop slowly so that such can be detected in their incipiency and arrested. Hardening of arteries give rise to no pain, but its presence is one of the causes of cerebral or retinal hemorrhages. Once such hardening has occurred, it can't be restored to its original elasticity, but a gradual increase in blood pressure or a definite alteration in the urinary secretion is sufficient warning which should be heeded.

Truth takes away a worry exaggerated by fear. We should not wait until eyes tell us of their inability, but we should have a health audit of our eyes and refractive correction for prolongation of good and active vision. Many a patient calling on us with lense cloudings or turbid vitreous would probably have never had to do so if a careful refraction during early life would have removed all possible ciliary or muscular strain.

In order to have a better understanding of foods and vitamins relating to bodily health, it will be necessary to elaborate upon the chemistry and physiology of digestion.

Proper nutrition must be of two kinds:

1. Chemical:
   That is there must be an adequate amount of each such as proteins, carbohydrates, mineral salts, fats, and vitamins.
2. Physical:
   We must have normal body tissues, a cheerful mental state, wholesome exercises and certain amount of leisure.

Most of the factors enumerated above are within our control and are self evident. Nerve irritability, worry, and overwork retard proper digestion or assimilation of foods, thereby laying the foundation to some chronic ailment.

Proteins

Those who are constantly seeking a thrill, usually pay at middle age; that is, advance of age through premature exhaustion of the suprarenal glands and hardening of arteries. The molecule of protein is too large to be absorbed by the digestive tract and the splitting of such is the function of the digestive process. The protein is split into Amino acids which as such can be absorbed. The food quality of any particular

protein depends upon the presence of certain amino-acids in the molecule and the percentage of such acids.

The successive changes in the protein molecule are very complex, the force or agency which affects such disintegration is through the activity of enzymes.

The nature and mode of action of enzymes are as yet not fully understood.

Pepsin digests most native proteins changing same to peptones.

Resorption of proteins is the resorption of their constituent amino-acids, which are crystalline compounds readily dissolving in water. These are easily absorbed by the epithelial cells of the intestines passing into the blood stream. After each meal we have a corresponding increase in amino-acids in the blood, which then rapidly absorb and are taken up by the various body tissues.

Surplus amino-acids not incorporated in serum albumin are burned as fuel and form the end product, urea, which is then excreted by the kidneys.

The daily protein requirement necessary to good nutrition depends upon a number of factors such as: quality of protein, amount previously injected, and rest. The average quantity consumed by a man of 150 pounds, is about 100 grams. This quantity may be changed by custom, taste, or convenience, and is not a true physiological requirement. Dietary experiments have proven that some individuals can live comfortably and maintain weight and vigor on nearly half that amount. In order to balance a low proteid intake, we must compensate with carbohydrates and fats. The body has no ability to store excess proteins ingested, such excess is either changed to fat or burned as fuel. The burning of such excess burdens the liver without any benefit to metabolism of the body. Excess proteid in the diet is easily tolerated and were this not true, heart and respiratory movements would be subject to marked irregularities.

The thyroid or its hormones materially influence the metabolic rate.

Thyroid insufficiency in adulthood, called Myxedema, is characterized by a general dropsy like swelling, especially the face and hands. The disease is associated with Atrophy of the Thyroid Gland and is marked by dullness of the mental faculties, sluggishness of movement, unsteady gait, and thick speech.

There is also a depression of proteid metabolism. A normal individual has a heat production of about 40 calories per square meter of body surface, while one with Thyroid insufficiency as in Myxedema, has about 23 calories, and in hyperthyroidism, about 75 calories.

Carbohydrates

Members of this important group are compounds containing carbon, hydrogen and oxygen, hence the name carbohydrates. These are divided into three major groups:

1. Monosacharids
2. Disacharids
3. Polysacharids

1. Monosacharids:

This group comprises three sugars and which are of great importance in nutrition.

a. Dextrose, also called glucose or blood sugar.

b. Fructose or fruitsugar, also in honey, and one of the easiest absorbed by the body.

c. Galactose or milk sugar.

All Monosacharids are absorbed by the intestines and ultimately changed by the body into glucose or blood sugar.

2. Disacharids:

The most important are:

a. cane sugar, beet sugar or sucrose
b. maltose or malt sugar
c. lactose or milk sugar

These are not absorbed by the intestines without being digested first. If cane sugar is injected directly into the blood, it is quickly eliminated by the kidneys without any benefit to the body tissues.

3. Polysacharids:

This is the most important group including all starches from whatever source. All sacharids are ultimately changed in the body to glucose. The liver contains about one-third of the total body glycogen, its two important functions are conserving of the body protein, and supplying available fuel for developing body energy. It also is important in storing such supply as a reserve source of energy, to be drawn upon as the body requires it.

Excess of sacharids injected will be changed to excess fat or will be eliminated in the urine.

Absence of sacharids from the food leads to increased destruction of body proteins, lowering of muscular power, and developing of mild acidosis.

Cane sugar yields only energy, it is mostly used, but is not nearly as efficient as sugars found in honey, dates, figs, ripe fruits, etc.

Regulation of sugar supply of the body is of greatest importance, since any increase of dextrose (blood sugar) in the blood, called hyperglycemia, is followed by elimination of such excess through the kidneys with appearance of sugar in the urine, called glycosuria.

It is interesting from a physiological standpoint that glycosuria may temporarily also result from too great an ingestion of carbohydrate food. The liver in this case gets more sugar than it can convert to glycogen and an excess gets through into the general circulation.

Our sugar regulating mechanism may break down in one of three ways:

1. Conversion of sugar to glycogen in the liver may break down in alimentary glycosuria.
2. Conversion of glycogen to sugar in the liver may break down in injuries to the central nervous system, etc.
3. Glycolysis of sugar in muscles and other tissues break down in diabetis mellitus and pancreatic diabetes.

Function of carbohydrates:

The general value of carbohydrates to the organism may be summarized as follows:

1. It furnishes a source of energy for the need of tissue cells, particularly in muscular work.
2. The oxidation of sugar furnishes an important part of the constant supply of heat needed by the body. Each gram of sugar yields four calories of heat on oxidation, and since carbohydrates form the largest part of our diet, and are easily oxidized, they must be regarded as especially available material for supply of animal heat.

Fats

A fat is a combination of glycerine and fatty acids. All fats are changed into glycerine and free fatty acids are stored in the mesentery, discharged into the thoracic duct and from there thrown into the blood stream.

Functions of fat are as follows:

1. Produces energy, is the principal source of body energy, such as heat and muscular power.
2. Fat keeps all vital organs in place and saves them from injury, especially the kidneys. It is the fat in the orbit which permits heavy pressure or blows without great injury to the eye.
3. It is an excellent non-conductor of heat and makes animal life possible in the Arctic.
4. Fats give stability to the body cells and the ultimate form in which excess food is stored in the body, permitting fasting or wasting diseases over a long period of time.

When the body needs energy it withdraws fat and burns it forming a combustion. A diabetic can not do this, therefore it forms acetone, causing acidosis of the blood and as such, is pathological.

The relative value of fats is about the same, except butter, which also contains vitamins. The selection is mostly determined by digestibility, palatibility, and custom.

Nutritive value of fats.

The fats are absorbed into the lacteals, chiefly as neutral fats, the so-called chyle fats; this is transported to the blood by way of the thoracic duct, remaining in the circulation for a considerable time, slowly

being picked up by the tissues, which can use it best in their metabolic processes.

Physiologically, body fat is regarded as a reserve supply of body nourishment and energy. Fat absorbed as food may temporarily serve the following purposes:

1. It may oxidize and form heat energy.
2. It may be stored in the tissues as body fat.
3. It may be synthesized with other substances to form more complex constituents of the body.

It is said that fat of the body originates directly from fat of the food. Milk seems to yield the greatest amount of fat.

Experience shows that individuals differ greatly in the ease in which they form fat. Heredity plays a great part. A sedentary life, absence of worry as well as advanced age are great influencing factors, therefore the old saying "fat as forty."

Fat provides a store of reserve food which is used by the body in debilitating fevers, deficiency or starvation. Hybernating animals work up a good store of food before their winter sleep. The humps of the camels are also a good protection in the desert.

Summary:

A. Proteins
   The nutritional value depends upon the variety and quantity of essential amino-acids. Excess proteins are either burned or stored as fat.

B. Sacharids
   Such sugars supply fuel in the most available form and are also necessary for normal combustion of fats. Excess is changed to fat.

C. Fats supply storage fuel, their function is about the same as above, hence palatibility and digestibility are the only factors of choice.

Mineral Metabolism

Mineral salts are as essential to good nutrition, as are carbohydrates, fats, or vitamins. They are found in the body in minute quantities and have very important influences. For convenience we shall only consider the most important ones, such as calcium, phosphorous, and iron.

Calcium:

It is the basic element of lime. The two principal calcium combinations we come in contact with are calcium carbonate (chalk), found in bones, an antacid taken for dyspepsia, diarrhea, and colic and calcium phosphate. Calcium phosphate is found in bones and enamel of teeth and is used as a food medicine. The chief sources of calcium dietary origin are: milk, cheese, and leafy vegetables. Daily calcium requirements depend upon

a. Age, b. Physical status, c. Activity.

The functions of calcium in the diet and the body processes are many, and very indispensable. Calcium causes coagulation of the blood and without it a patient is called a hemophiliac, that is, bleeds upon the slightest provocation and during slight operations is apt to bleed to death.

The quantities required in the daily diet vary with different authors, but all agree that children between the age of four to eighteen require about one and one-half times as much as adults, because growth of bone and soft tissues is most active during early life.

It is a well known fact that children of poor imigrants born in this country are usually considerably taller than their parents. Climate or other conditions may be factors, but it seems probable that the greater quantity and better quality of their food will account for much of such growth.

Growth is a product of:

1. Heredity

   Realization of heredity is intimately associated with functioning of the endocrines. Overaction of the pituitary gland during early life causes abnormal growth of the long bones, underactivity the opposite.

2. Quantity and quality of food:

   Assuming of normal functioning endocrines, the quantity of food is an important factor. Quantity is an expression of energy intake. Deficiency in food results in body weakness and restricted breath. When the quantity of food is below energy requirements, the legs will grow, at a normal rate, but the chest expansion does not and the soft tissues are flabby. No child can grow to normal proportions without an adequate amount of vitamins A, B and D.

Inorganic salts are mostly an accessory article of our diet. The body including the bones, contains about 4½% of mineral salts, which after incineration remains as ash. The main function of inorganic salts is to maintain a normal function and composition of osmotic pressure in the body. The proper percentage of mineral salts controls the flow of water to and from the tissues. Salts are necessary in the normal reaction or irritation of the individual molecule. We all know of the importance of calcium salts in the coagulation of the blood and curdling of milk, also the peculiar part played by calcium, potassium, and sodium salts in the rhythmical contraction of the heart muscle and the irritability of muscular and nervous tissue.

The special importance of iron salts for the production of hemoglobin is also very evident. Sodium chlorid (common table salt) occupies a peculiar position, inasmuch as it is the only salt which we deliberately add to our food.

Accessory articles of diet, such as condiments, flavors, and stimulants, are only of value in making food more appetizing and increasing the secretion of the gastric juice.

Stimulants such as alcohol, tea, coffee, or meat extracts (beef tea) in themselves contain very little actual food value. Coffee and tea owe their well known stimulating activity to its alkaloids, caffein, or trimethylxanthin. These have a diuretic action on the kidneys and a stimulating effect on the nerve centers, slightly raising the blood pressure. The well known action of preventing sleep when teas or coffee are taken late, are due to the rise in blood pressure, acting upon the brain centers, preventing sleep thereby.

Alcohol:

The physiological effect of alcohol is of peculiar interest to mankind, owing to its widespread use and especially to its disastrous results following its intemperate consumption. Those who drink it to excess usually acquire an alcohol thirst or habit, toward which the body possesses no counter regulation.

When food is taken in excess we experience a feeling of satiety, destroying the desire for more food. The same with water, not so, however, with alcohol. The liver and heart are the organs most severely affected in chronic alcoholism.

Under conditions of stress and of maintained exertion, alcohol is of little value as a stimulant to the neuro muscular apparatus. Whatever action it has is only temporary. After a hard day's work, or in a condition of mental depression, the use of alcohol may remove the sense of fatigue and exhaustion and lead to a sense of well being. This after all is only temporary.

Vitamins

Until 25 years ago, it was thought that food containing the necessary proteins, fats, carbohydrates, and mineral salts, were sufficient for anyone as a well balanced food. About this time several chemists such as Funk, Hopkins, Osborne, Mendel, McCollum, and Davis proved that nutrition fails when these substances are fed in a purified state. Funk found that some foods contained certain substances which were neither protein, carbohydrate, fat or salts, and which had life-giving qualities, often restoring health to individuals who were near death. On account of their life-giving qualities they were called vitamins. They are also spoken of as "accessory food substances."

The development of our knowledge and of their function in nutrition is very fascinating and of tremendous importance to health. Each vitamin seems to exercise a special influence in nutrition. Inasmuch as the chemical composition of these vitamins is not known, they were named with letters of the alphabet as: A, B, C, etc.

Vitamin A

Was found to protect against infections and is very essential to the health of the eyes. Without it, eye diseases, sinus infections, mastoiditis, chronic tonsillitis and similar infections develop very easily. They are very common where Vitamin A is not supplied.

The most reliable sources are whole milk, butter, cheese, egg yolk, cod liver oil, glandular organs (especially liver, heart, kidney, and fat) thin green leafy vegetables, yellow corn, yellow sweet potatoes, carrots, and other yellow or green foods.

Functions:

1. Promotes tissue formation.
2. Prevents infections, especially of eyes, air passages, and sinuses.
3. Increases red cells of the blood.
4. Acts as a regulating substance.
5. Promotes growth, appetite, and digestion.

Results of deficiency:

1. Loss of appetite.
2. Retarding of growth and development.
3. Physical weakness.
4. Susceptibility to eye diseases, especially corneal ulcers and phlyctenular keratitis, otitis media, or renal calculi.
5. Diseases involving air passages, lungs, and skin.
6. Retards reproduction, by failure of ovulation.
7. Excessive growth of Lymphoid tissue (adenoids, etc.).
8. Secondary anemia.
9. Dullness or perversion of special senses.

Result of absence:

1. Eye inflammations and ulcerations.
2. Cessation of growth.
3. Failure of appetite and digestion.
4. Formation of pus in ears, sinuses, and glands, at the base of the tongue, also pyorrhea of the gums and abscesses of teeth.

Vitamin B

Its deficiency leads to nervous disorders, insanity or various forms of paralysis. The health of the brain depends largely upon the Vitamin B.

The ease with which Vitamin B may be destroyed depends largely upon the alkalinity or acidity of the liquid containing it. Natural acidity of tomato juice conserves it, heating destroys it. Food dried at low temperature in absence of air loses very little of its vitamin content. Most reliable sources:

Whole grain cereals, milk, peas, beans, raw fruits, such as tomatoes, grapefruits, lemons, oranges, and nuts, buttermilk, vegetables, egg yolk, honey, and yeast.

Functions:

1. Increases appetite and promotes digestion. Promotes growth by stimulating metabolic processes.
2. Protects the body from nerve and brain diseases.
3. Increases quantity and improves quality of milk of mothers during lactation.

Results of deficiency:

1. Impairment of appetite and digestion.
2. Loss of weight and vigor.
3. Constipation, pyorrhea, emaciation.
4. Subnormal temperature.
5. Enlargement of adrenal glands.
6. General increase in size of glandular structures.
7. Various manifestations of the nervous system even leading to paralysis of muscles.

Results of absence:

1. Beri-beri paralysis of certain groups of muscles.
2. Peripheral and other forms of neuritis.
3. Atrophy of lymphatic tissues.

The body has very little capacity of storing excess Vitamin B, hence it should be ingested with reasonable regularity.

Vitamin C.

Its deficiency leads to scurvy, also severe mouth and tooth infections. We often find granular degeneration of retinal tissue. The blood flow is retarded in the end arteries and congestion results. Bones and teeth cannot be properly nourished and bone marrow has a reduction of the normal quantity of blood forming cellular structure without this important vitamin.

Most reliable source:

Orange juice, lemon juice, tomatoes, bananas, sprouted grain, green leafy vegetables, raw cabbage, and milk when cattle are on summer pastures.

Functions:

1. Regulating substance.
2. Prevents scurvy.

Results of deficiency:

1. Change in disposition.
2. Capricious appetite.
3. Loss in weight and physical weakness.
4. Shortness of breath and rapid respiration.
5. Rapid heart action.
6. Congestion of internal organs.
7. Tendency to hemorrhages.
8. Reduced hemoglobin.
9. Reduced secretion of adrenals.

10. Reduced weight and efficiency of spleen, liver, stomach, and intestines.
11. Necrosis of pulp of teeth, pyorrhea, redness of gums.
12. Friability of bones.

Results of Absence:

1. Scurvy, 2. Syncopy.

Vitamin D.

Deficiency causes rickets, but also predisposes to chest infections and tuberculosis.

A great number of children in the public schools have visible evidence of Vitamin D deficiency. Content of Vitamin D in food is closely related to the sun's rays. It is synthesized in green tissues of the plants, especially in the leaf. Animals must depend directly or indirectly on plant tissues for its supply.

Most reliable sources:

Cod liver oil, egg yolk, whole milk, exposure of the naked skin to sunshine, or if not, ultra violet light. Animals get this vitamin in a great measure from the short wave length rays of the sun, changing the ergosterol of the skin into Vitamin D.

Functions:

1. Controls calcium equilibrium and regulates mineral metabolism.

Results of deficiency:

1. Muscular weakness.
2. Instability of the nervous system.
3. Lack of resistance against tuberculosis and other infections.

Result of Absence:

1. Rickets, 2. Deformity of bones, 3. Tuberculosis.

There has been considerable study of calcium in relation to cataract, but there is no evidence up to this time that calcium deficiency or its oversupply is responsible therefore.

The crystalline lens has been particularly adopted for experimentation, as it is suspended between the aqueous and vitreous, not depending upon the circulation of the blood, but upon a process of endosmosis, exchanging materials chiefly with the aqueous humor.

Some senile cataracts are caused by an exaggeration of the decrease in the permiability of the lens capsule, which normally takes place with increasing age.

Vacuoles, water splitting of sutures and separation of the lamellae of the lens, in cortical cataract, represents a breaking down of the complicated colloidal solution of the cortical protein with extrusion of the water molecule from the lens molecule. The corticular variety begins in the senile cortex with vacuoles, water splitting of the suture, or lamellar separation, going through the familiar stages to maturity. The posterior corticular saucer shaped variety develops much slower.

Death of tissue, anywhere in the body, is usually replaced by granulation tissue very rich in calcium, and will lead to formation of bone if the iron concentration is right and if there is a local supply of calcium available. An example of this is found in the abnormal formation of bone in the choroid, which forms a bony wall around the vitreous. The writer has just had a case like this in an advanced chronic Glaucoma, where after enucleation, he has had to use a fine saw to cut the eye ball open.

A lens cannot replace dead or dying lens tissue, with connective tissue, as in other portions of the body, due to the fact that the lens has no blood supply and is enclosed in a capsule which permits nourishment only by means of osmosis through the capsular epithelium, therefore, deposits of calcium are in some other form.

The presence of increased calcium in cataract is either:

1. Primary and an actual etiologic factor in producing lens opacity.
2. Or secondary to local changes in the tissues which exist in the lens regardless of calcium content of serum, aqueous or lens.

Studies by Friedenwald and Adams showed that there is no evidence that the calcium content of the lens is increased before cataract forms. One must, therefore, come to the conclusion that the increase of calcium in cataract is not primary, but that it is a coincident or secondary change which takes place or follows other chemical changes of the lens. In cases of senile cataract the deposition of calcium most probably results from:

1. Very slow death of lens tissue dependent upon nutritional deficiency.
2. Degeneration of lens protein with lipoid by-product.
3. Local concentration of calcium by absorption of the large lipoid molecule.
4. Deposition of calcium by a change towards alkalinity.

Vitamin E.

This vitamin has to do with reproduction. Inasmuch as there is no particular complaint or apparent deficiency along this line, it is unnecessary to go into this phase at this time. The American nation is still increasing at a normal rate.

Many diseases afflict the civilian, who ignorantly lives largely on white flour and sugar. The diet of primitive man and the animals in the fields contained almost 100% vitamin food. The diet of so called civilized man contains often not more than 10 to 15% vitamin, causing chronic diseases at middle age.

A foundation of a good diet to which other things should be added is a combination of whole wheat bread, orange or similar juicy fruit, milk and cream, eggs, honey, butter, vegetables, fruits and fresh meat.

In the United States last year there died over 100,000 men under forty years of age, of diseases characterizing early senility.

What does this mean?

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OPTOMETRY'S EDUCATIONAL PROBLEM*

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(Continued from Page 304—August Issue)

California requires that enough units shall be elected in Physics or Social Sciences to satisfy the requirements for bachelor's degrees majoring in Physics. The list of electives is quite diversified.

Columbia presents a well diversified program of electives including Physics, Physiology, Biology, Sociology and other subjects from which the student may add to the required curriculum, the total not to exceed 140 units for four years.

Ohio allows considerable latitude in electives. But the requirement for Bachelor of Science majoring in Physics must be satisfied, naturally.

Rochester presents a list of advanced courses in Physical Optics.

Southern California recommends the election of German in the second year and there are available courses in Illumination or other subjects associated with optometric studies for the third and fourth years.

SUMMARY

	Group 1 Cultural	Group 2 Unclassified	Group 3 Basic Science	Group 4 Physiology	Group 5 Optics	Group 6 Optometry	Group 7 Electives	Total
California	13	8	23	14	9	32	20	129
Columbia	30	7	23	8	17	39	6	130
Ohio	8	7	20	35	10	41	19	140
Rochester	18	6	22	18	14	36	18	132
Southern California	9	11	19	26	7	43	14	129
Pennsylvania (3 yrs.)	..	..	18	22	12	62	..	114

By studying these lists, we can not only see the relative strength or weakness in the courses planned by these various institutions, but we may gain data useful in strengthening all. We see the heavy load of

*An abridgement of the material presented before the American Academy of Optometry at Omaha, December 15, 1930.

cultural subjects and the very weak offering in physiology at Columbia. We note the only schools leaning heavily on mathematics are Columbia and Pennsylvania. We note how thorough the preparation in physiology in Ohio, yet from this the ground work of biology is inexplicably missing. We see Columbia, Rochester and Pennsylvania still under the thrall of German and English traditions in the study of theoretic optics. We note Southern California breaking away from those traditions. We see Rochester completely ignoring the traditional presentation of Physiological Optics, and introducing it in an entirely new method, far more logical, more thorough and more applicable to optometry's special need. We note the better balance at Ohio and Southern California than in any of the university courses and the top-heavy character of the courses at some of the colleges brings realization that some of the criticisms we have heard had some foundation. We do not wish to seem invidious, but this situation has now become so acutely critical that it is necessary that we be frankly outspoken. To evolve the ideal course is not easy, nor is it the matter of a few months' consideration, but is a study demanding many years. It is time we seriously undertook that study.

It is not only the listed courses that are to be given thought, but the contents of those courses and their co-ordination is still more important. And that matter of co-ordination is the weakest link in the entire system, not only in the university courses but in the independent and private schools. That problem will not be solved until we develop a corps of trained teachers experienced in optometry and its problems and a series of text books. Today, we have no text books whatever and very few teachers with the requisite background.

Ohio, Southern California and Rochester are strong in the physiology courses, these being the only places where Advanced Physiology is given. Pennsylvania could well replace the mathematics and theoretic optics with courses in Biology, Advanced Physiology and more Psychology. But such courses are useless if they are not interwoven with optometric interpretations. It is in these subjects that we get an understanding of ocular functions and dysfunctions, here is the information that enables us to interpret such optometric questions as the phoria and duction tests, hyperopia in its phases of "absolute," "manifest," "latent." It is in these studies that the secret of myopia's mysteries are to be learned. In none of these problems do theoretic optics have any part. The one thing that inclines me toward the university training for the optometrist is the fact that the heads of the Physics Departments understand this very thoroughly and all are awaiting the time when optometrists shall also realize it.

Courses in optics, geometric, physical, physiological, were given universities long before the word optometry was coined. Then when optometry came along, seeking more education, these traditional courses were supposed to meet the need. There are many other lines than

ophthalmology and optometry that need training in theoretic optics and physiological optics and these courses meet their needs, the courses were developed to meet those needs. They are not the courses that professional optometry specifically needs. Some of the universities have already realized that and are attempting to develop the specific courses needed. But there is a problem. Attendance is not large enough to justify expenditures on special classes in some of these subjects. The courses have to include all the material that a wide diversity of occupation might include, they cannot be narrowed down to one group unless there are enough students in that one group. That is not only true of the optics courses, but of the courses in biology, physiology and psychology, perhaps some others. So there we confront tradition which has charted out the contents of the course and the exigency that makes it impossible to provide special classes for a very small group.

The answer is endowment of optometry courses so that funds are available for these special courses and classes. Endowment so that the department can be independent with its own head who can devote all his time to the study of conditions and the development of the special courses. As we have noted before, the independent school, if properly endowed, is really in a better position to develop with changing conditions than is the university. Still, we see the universities making considerable headway, even with the tactical disadvantages that might be thought to hamper them somewhat. And we must also point out that the private schools and the independent schools have not shown themselves entirely free from traditional influence that says that any one dealing with one branch of optics must cover all the filed of theoretic optics.

The whole problem is not shown in the list of courses. There is the teaching problem, mentioned, of co-ordination of the preliminary foundation studies with the subjects taught in the vocation courses. There is the weak point in every one of our schools today, universities, independent schools, private schools, all are weak in that most vital thing of all. In the vocational courses, tradition and precedent rule. Outworn theories, that never had a foundation of experimental investigation, are parrot-like chattered from the teacher's stand. When the groundwork obtained in the basic studies is carried through, by experimental research that definitely shows the connections, then optometric practice by the students graduated from these colleges will be highly successful. Today the students are receiving the background for real optometric work, but the connecting link is lacking.

We might as well be frank about it and admit that one of the reasons for this is few of the teachers in the vocational subjects have ever had the opportunity of studying the foundation subjects that their students have taken. Then of course they cannot bridge the gap. Do not understand that I am finding fault with any particular teacher or any special group of teachers in any personal way. It is a condition

that exists. It will be righted in time, but if we frankly recognize it, we shall that much more quickly take steps to right it.

Why select a teacher of ocular anatomy merely because he can make a clever gross dissection of an ox's eye and mount it up to look pretty? While he knows nothing, from direct experience, of the more intimate anatomy of a human eye. Why teach students to rattle off the layers of the retina, when neither they nor the teacher understand the functions and purposes of those layers? If you do not believe this is possible, ask some of the graduates, from any school, to describe these functions, to tell you what each of those layers means.

A short time ago I received a letter from a graduate of one of the universities giving a very splendid course in physiology in which he asked a question about the ductions. I was surprised at his question because I knew where he had taken his work and I also knew that he was one of the outstanding men in his class. I made reply, therefore, that he had done laboratory work in his second year that answered that question and described the experiment to him. He wrote back that no one had ever shown the relation between that experiment and the question he asked. But he saw it, immediately it was pointed out.

I listened recently to a discussion of a certain type of ophthalmic lens, presented by a recent university graduate. The description of the path of a ray of light through the lens with the resultant effect on the emergent ray was excellently done, but the resultant effect at the retina was wrongly stated. There is no criticism in my mind of the student. The criticism is directed toward the school system that centers in the training of an optician versed in the construction of lenses rather than in the training of an optometrist versed in the application of lenses and their effect when placed before the eyes.

While our students are amassing a lot of information, it means very little to them. This is the condition to be righted.

Whatever may be the personal view of any of us as to the place of the optometry course in the university, it is now there to stay. The fact that the university has recognized optometry is sufficient ground for us to thoroughly believe in the future of professional optometry. The optical store of the past is rapidly disappearing, its economic advantage is already gone, it will not be long before it is completely extinct, dying for lack of public patronage. The force that is driving it out, that is replacing it with professional optometry is the growing academic education of the public. Now it behooves us to so prepare our students that after graduation they shall not be forced to join the ranks of the opticians whose future is threatened.

Then we have these tasks: The endowment of schools, geographically distributed so as to be fairly well accessible to prospective students, and so well endowed as to be independent of the necessity of volume of business, but able to reject applicants who are manifestly unfit to succeed

or who are insufficiently prepared to benefit from the instruction that is given them. That is one.

Secondly, the development of courses calculated to develop these students into successful practitioners; competent to read intelligently and with benefit the reports in English, French and German of investigators in physiological and psychological problems of moment to optometry; competent to keep optometric practice abreast of the times, taking advantage of newly discovered information; competent to think for themselves and able to analyze the fallacies that are always appearing; competent to carry optometry to a level with other professions; competent to so well serve the public that their profession is recognized as more than trading in optical specialties; competent to bring relief to worn and weary pairs of eyes; competent to develop such newer, improved methods as their better learning will surely suggest.

This second point is not a matter for the schools alone to solve. The solution must largely come from the practitioners in the field. It has been that way in every other profession, it must be that way in ours. It is fitting that authorized committees shall investigate thoroughly the courses as taught and inform the schools what the representative part of the profession wish done for the improvement of the courses so that they shall graduate competent practitioners into our ranks.

We are not to expect that the new graduate shall be an expertly experienced optometrist. But we have the right to expect of him who asks to join us, to take up his work along side of us, that he shall have that foundation whereby he can become expertly experienced. We are not helped by having an incompetent optometrist come into our towns. We are helped and our business is made better when a new man comes in that is a thoroughly good professional optometrist. And two things most of our graduates lack, clinical experience and some idea of how to conduct an office practice. Some of those who have had pretty good success in their clinical work in school fail because there has been no teaching in the conduct of an office practice. Give a man proper instruction in that and you will not find him going behind the counter of a chain jewelry store to sell glasses. Send him out into the world without that, and experience has shown that he has small chance of success, he is forced to get a job where and when he may.

Perhaps the hardest problem the university must confront is that of finding sufficient time for clinical practice. A course leading to the bachelor's degree cannot be overweighted with laboratory work, which is the natural classification of clinical instruction and practice. This is a matter about which every university department head with whom I have conversed has expressed himself as dissatisfied, yet unable to cope with. Pennsylvania found that in a two year course not enough time could be given to clinical practice and so added a third year that is

almost entirely given to this work. We may here note, with a great deal of interest since there are so many that say that students will be lost by the introduction of a three year course in place of the old standard two years, that Pennsylvania at first gave both two year and three year courses, that a very large percentage of the two men voluntarily remained for the third year, and that finally the demand for the three year course became so great that the two year course had to be abandoned, for lack of students and lack of facilities to care for the minority when the majority wanted the three years.

The third and hardest problem is that of the training of teachers for our schools. Manifestly, the teacher should have a thorough groundwork in many of those subjects that we have just said can be greatly abbreviated in the training of the practicing optometrist.

There are two groups of teachers to think about. Those who teach basic subjects, as biology, physiology, psychology, mathematics, theoretic optics, in one group. In the other group those who teach the theory and art of optometric practice.

Of the first group, we must ask that they be so intimately conversant with optometric theory and practice that they are able to begin, in the earliest phases of their instruction of students, that relation between this fundamental subject and the practice that is so vital but that is so noticeably lacking at present. That will be a very hard problem to solve.

The second group, as in every other profession, is logically drawn from those who have proved successful in practice and who at the same time have teaching ability. That may look hard, but it is not, provided the financial obstacle were surmounted. There are at present a number of successful practitioners in the country with the requisite academic training and possessors of college degrees, bachelor's and master's, who possess all the qualifications for successful teaching. But teaching does not produce the necessary income.

It is fitting and proper that the instructor in the practical subjects of professional practice should devote part of his time to private practice. That would prevent his becoming over theoretic. It is right that he should augment his income from teaching by practicing, since the teaching income cannot be expected to be adequate. And that is the rule in other professions.

But that is very different from a condition of which there is too much today, where incompetent practitioners seek to augment their incomes by teaching. That is not proving satisfactory in our profession, has not proved satisfactory in other professions and cannot be expected to prove successful. The teacher of theoretic subjects can be a very successful teacher while he is financially impractical. But the teacher of practice must be a successful practitioner.

While there is material sufficient at hand to supply every school in the country, we cannot call these men to abandon their lucrative practices, move to other cities and live solely on a teacher's income while they are building up a new practice. Endowment would care for this.

And at the same time, such endowment would solve, at least partially if not wholly, one or two other problems. One is research, the other is the bringing into the field of men with the proper academic degrees to place the optometric teaching staff on a par with other departments. A man with a bachelor's or master's degree is in line for higher degrees, if he devotes time to research so as to earn the higher degree. And in no field of human activity today is experimental research so needed as in optometry.

Were we to provide funds for teaching fellowships, if we were to take one or two of the competent men now available and use them for the two-fold purpose of instruction and research, as is done in every other field, we should within a few years have the men at hand for whom we now cry, the men with the required training and academic standing to head our departments and so make them independent, not a subdivision of the physics or any other department. In the meantime, these one or two men could have established themselves in the new communities so as to be independent of our endowment funds, which could then be devoted to the development of more teachers.

This Academy has shown its willingness and its ability to finance research work. The suggestion is here made that this research program be made a part of a wider program leading not only to increased knowledge that will be brought to us by the research, but will strengthen our academic position in two ways, by giving us more men with academic degrees and giving us a few more trained teachers.

Of course, we cannot go into a big scale production. That is not only impossible but unwise. One man at a time, at first anyway, but this done with a definite purpose and as a part of a definite program.

Teachers of optometry cannot be created from teachers of physics or physiology or psychology. Teachers of optometry must come from the front ranks of optometry just as teachers of medicine, dentistry, law, come from the front ranks of those professions.

The much mooted question of the doctorate degree in optometry will be settled, automatically, when optometry puts itself on a scientific basis and when the mass of optometrists practice in professional environment, but not until then. The universities are not prejudiced against giving the doctorate degree when the time is ripe. First, the courses must be so aranged, become so standardized, that they are truly professional courses given under the auspices of optometric department heads and with properly trained optometric teachers. That means, to reiterate over and over again the first step for optometry, endowment

of its education. That means graduates doing post-graduate research work in optometric subjects, bringing to light undiscovered knowledge, adding something of value, and receiving advanced degrees for that work. Which brings us again to the fundamental need, overshadowing all others, endowment for research work and the training of teachers.

Rochester is the only university that has formally recognized the distinction between optics and optometry. The Institute of Optics offers two courses, one in optical engineering, leading to the degree of Bachelor of Science in optics; the other, a course in optometry leading to the degree of Bachelor of Science in optometry. Columbia gives the degree, Bachelor of Science in optics and optometry, which is representative of the course. So far as I have been informed, the other universities have not used a special form of degree.

Two of the universities have let it be known, unofficially of course, that they have the doctorate degree under consideration but the present status of optometry in the minds of the optometrists themselves cannot warrant the bestowal of this higher degree. The only thing that obstructs the doctorate degree is the low conception of his own profession in the mind of the mass optometrist.

In earlier years, some of the private schools were chartered by their states with the right to give the degree, Doctor of Optometry, to their graduates for a limited number of years. Most of those charters have expired. They could not be renewed today with the higher educational standards effective in those states. But we must note that the state of Pennsylvania, with educational standards of a very high order, has granted the degree to the three year graduates of the Pennsylvania State College of Optometry, that enabling act being passed on the representations of the Pennsylvania optometrists as to their educational ideals. Optometrists can have a doctorate degree on a par with the doctorate degrees of the other learned professions when they show an educational program and a professional practice on a par with other professions.

So long as the great majority of optometrists style themselves optometrist-opticians, so long as they practice more as opticians than as optometrists, so long will the doctorate status be delayed. The disliked definition of an optometrist as "an optician who fits spectacles," will remain in force so long as the mass practice that. But that practice must continue until we are able to so educate our practitioners that they know how to conduct a professional office practice with financial success.

Optometry's fourth educational problem is that of assistance to the men now in practice. All over the land, hundreds of men are clamoring for instruction and their need is not being met in a practical way. Privately owned small institutions are not going to give an answer to this. That is merely repeating the experience of past years in under-graduate work, which we have been forced to grow out of.

Instruction in the many varied subjects by one man only is out of the question. The school for the practitioner must be as well organized and with a staff of teachers, just as is the under-graduate school.

It does not seem the province of optometric state organizations nor of the national organization to enter this field. Nor would it be possible with the present forms of organization.

It is within the province of the present established schools to oversee this education of the practitioners now in the field. Not only is it within their province, but it is their duty.

The most acute part of the problem is that the instruction must be carried to the men, the men cannot go to the instruction, not in sufficient numbers to amount to anything. We note that those who would be able to leave practice for a few weeks and travel a thousand or two thousand miles to a school are the very ones who do not wish to. That is natural. They are complacent. The man who is disturbed, who realizes that he must have some practical instruction to pull him up, is the man who has not the means to make a long trip nor can he afford the loss of income entailed by closing his office. He must have each day's receipts for each day's needs. It is true that there are exceptions both ways. There are a few who wish further instruction and are able to go for it, if it were available. There are a few who need instruction and who would be financially benefitted by having it who do not want it. But the vast majority of our practitioners fully realize their need and would take advantage of educational courses if they were made available.

Up to the present, we have made little headway on this problem. At our state conventions, usually the effort is made to bring two or three speakers to relate their own ideas or their own experiences. Too often, sufficient funds are not available so that the convention has to depend on some jobber or manufacturer who wishes to demonstrate his equipment. Often these bring us new information that is of great service to us, but that is not an educational program. Some of us feel that the organization meetings are not the proper places for such demonstrations but that these salesmen should get their groups together at some other time and place.

We have a great many successful practitioners who have developed new methods of great value. Many of them are available for state conventions. But this country is so tremendously big, distances to be traveled are so great, that few men can afford to leave their offices for three or four days to go to some place where they can only speak for an hour or two, nor can they spend from one to two hundred dollars to get there and back. So they have to ask a compensation that is too often more than the societies' treasuries can stand.

We have seen some men who had something worthwhile and were desirous of communicating to their fellows the information they

had gained by study and experiment who have thought they could make occasional trips and by charging admission fees collect enough to pay their expenses and perhaps make up what they lost by being away from their offices. Those experiments have always failed, they are not financially possible. The man who has a fair practice cannot leave home for a lecture trip unless he plans it as a sort of vacation and sight-seeing trip without regard to his loss.

All these means of bringing educational facilities to the men in the field are desultory, without co-ordination, are not a part of a program, and accomplish very little in comparison with the tremendous effort involved.

The only program that has been developed is that of Dr. Skeffington. His little study groups, scattered here and there, are a tremendous force toward raising the level of optometric practice. But no one individual should be forced to make such a tremendous effort nor can that result in the fullest degree of benefit.

Then these various lecturers who make themselves available or who are called out of their offices, have ideas of their own that are not always in agreement with those of some other lecturer who has appeared before the same group a few weeks earlier. This brings confusion to the men who are there hoping to learn of something useful to their practice. A tells us something, B tells us it is not so. Whom shall we believe? The result is discouragement. These lecturers should be co-ordinated. Not that we think they should agree on everything, for that would be suicidal. Disagreement is the first essential to progress. But if these various speakers could in some way be fitted into a harmonious whole, so that at least they would refrain from ridiculing each other, more good could be accomplished.

I believe that lecture courses, or clinical classes, or some form of co-ordinated instruction with definite purpose can be arranged without financial difficulty. I do not believe that one who has shown himself to be a good teacher and successful in the lecture field, should be forced to spend his time and energy in planning trips, getting together classes or getting local men to get classes together. I believe this is a function of a school. I believe that now the optometrists want their instructors to come with some authority, other than own self-made fame, or as one said to me a few weeks ago, "Who has sold himself to himself." I believe that the school that will undertake this task will succeed in it. And I believe that would be doing more for optometry's future than could any other movement.

I have spent a great deal of time on the problem of our schools, but this again would be in large measure solved if we could carry to our practitioners that training in practical optometry, that training in the proper conduct of an office so that it shall be financially paying, that would hearten them, lift them out of their slough of despond,

show them the picture of the greatness, the vast width and breadth, the gloriousness of optometry.

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[Editor's Note—This is the fourth and concluding chapter of a series of papers by Dr. R. M. Peckham dealing with optometric education in our leading colleges and universities. The first chapter appeared in the June, 1932 issue, page 219. The second chapter in the July issue, page 250. The third chapter in the August issue, page 294.]

—C. C. K.

POSSIBILITIES OF GLARE REDUCING VISUAL ACUITY*

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Whether glare reduces the quantity or quality of vision has not, I believe, been gone into in sufficient detail. It is true that at times it is stressed far more than it should be, but on the other hand very frequently we fail to see its great significance. Beyond any question of doubt there is a certain relationship between glare and poor vision. At times this relationship is not so pleasant for the patient, but on the other hand very often glare has no apparent influence whatsoever upon visual acuity; perhaps it has more effect on the quality of vision.

Here it is wise to differentiate between the quantity of vision and quality of vision. By the *quantity* of vision we mean the sharpness of distinction of average objects at an average distance away. By average we generally mean the amount visible with accommodation relaxed. By the *quality* we mean the ease with which we can observe the very same objects at a given distance. Hence a person may be able to distinguish an object subtending one minute angle details under various degrees of illumination, but it will only be comfortable vision within certain foot-candle power of illumination. Therefore, if the quantity of illumination is less than that corresponding to average daylight, or if this illumination is increased beyond this quantity, the patient may have the quantity of vision but hardly with the same ease, in other words, with poorer quality.

We refractionists frequently fail to differentiate between these two factors. The average teaching has stressed the consideration of visual acuity. By this was meant the quantity of vision without giving any regard to quality. The visual acuity we measure by Snellen's method, giving us only the quantity. To gain knowledge of the quality we must consider many other factors. One may safely say that common sense is the best guide here.

Let us consider Fechner's law while discussing excess or insufficiency of illumination. We must have a difference of 1% of illumination at least to make two adjacent objects visible. That means that if we have two objects illuminated from two different sources of light, the visibility of one object we may increase as compared to the other object, by either increasing the amount of illumination over the more clearly desired one or else by decreasing the illumination over the object which is not to be

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seen so clearly. In other words, the vision of objects, even if they subtend one minute details of visual angle, will not remain the same under varying conditions of illumination and will become invisible if the relationship is less than 1%.

These points hitherto mentioned are to illustrate that besides considering the visual angle for obtaining balanced and comfortable vision, we shall consider also that factor, which brings about contrast between various objects viewed. In other words, vision will vary under different degrees of illumination. Of course we take it for granted that the various absorption powers of different materials will affect the quantity of reflected illumination.

It is quite logical then that there must be a limit of distinction between two objects if one's illumination is increased to a GLARE POINT. By "Glare Point" we mean that point at which an object loses its identity to our visual perception as a result of increased illumination. Therefore, glare can cut down the quantity of vision as well as the quality. We are all familiar with the fact that under glare, or excess of illumination, we cannot see as comfortably as we can under average daylight. In addition to that the amount of visual acuity may also be cut down as a result of glare in a great number of cases.

Somewhat erroneous comparisons have frequently been made between the eye and a photographing camera. While the optic principles in the mathematical calculations are correct, we must remember that the anatomy and physiology are quite different. Is the crystalline lens composed of the same material as the lens of a camera? Of course not, with the result that the crystalline lens can change its curvatures in response to accommodation, while the camera lens cannot. The photographic film is chemically prepared to receive photo impressions, but the retina is a complicated nervous structure acting as an intermediary between the light entering the eyes and the brain interpreting them. In like manner, the explanation reducing frequently visual acuity cannot be done by a comparison between the eye and the camera. Contrary so. The light entering the eye will cause the iris to contract. The more the illumination the smaller will the aperture become. This creates a clearer, more defined image upon the retina as a result of cutting down upon spherical abberation, thus reducing the number of diffusion circles. According to this, with glare we only have a small pupil to permit light to go through, which would give us a sharper image upon the retina. This is contrary to what we find in certain percentage of people when experimenting with great numbers of patients. One may say that if the camera is different from the eye physiologically, why are color filters used in photography to bring out a picture clearer, while in the human eyes we apply similar procedure by prescribing tinted lenses against glare? The answer is still the same, the camera and the eye are not the same physiologically, as the filer in photography serves to absorb light which produces a haze around objects (due to glare) upon the chemi-

cally prepared film. The tinted lenses will cut down the excess of light, which the retina could not utilize properly in transferring it to the brain in the form of nervous energy.

The main reason we find a diminution in vision under glary conditions can be traced to the chemical response in the retina together with the nervous response in the brain. As has been described elsewhere in this paper, the retina can only receive a definite quantity of light and utilize it to the fullest extent properly. The excessive amount of light that will reach the retinal cells will require added amount of rhodopsin to transform the light energy into nervous energy, hence it will be an added burden imposed upon the nutritive supply. This would necessarily mean a difficulty. As we have in our vascular system only a definite amount of fuel that could be used by our structures for the maintenance of their lives, we cannot afford to overdraw this supply. If we do, then there will be lack of function, or sluggish function. Referring to our discussion on the effect of glare upon visual acuity, we can apply the same logical reasoning. Excessive light, reaching the retina may need an amount of nutrition in excess of the amount stored up or immediately produced by the vascular system of the retina. The result in this event will be a sluggish response of visual elements. This, indirectly, will result in cut down visual acuity. In the writer's opinion, this is the explanation of the cause for reduced visual acuteness under certain conditions of glare.

Of course, not every person's vision will be cut down by excessive illumination. If one's health is kept in proper shape, it is quite logical that such a person will have more stored-up energy and a larger supply of nutrition ready for the abuse of various structures. Up to about a year ago, the writer recorded findings relative to comparisons of visual acuity between patients being corrected with white lens and the same patient being corrected with an absorption lens. Over one thousand cases were recorded between the ages of 8 and 93. This experiment indicated very definitely that there is a definite relationship up to the presbyopic age. After 40 the average hyperope as well as myope was almost evenly divided, as to decrease or increase of vision with the absorption lens. (Soft Lite)

May the writer repeat that in his six years of experimentation with glare he has found that the defect PHOTOPHOBIA has been far more pronounced in recent years than the older data can explain. It is no doubt that our present ways of living, i.e., taxing our eyes to glare in our everyday surroundings, that have been largely responsible for the oncoming sufferings of the public in this regard. In addition we must bear in mind to consider QUALITY of vision besides QUANTITY of vision.

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IMPROVEMENT IN VISUAL ACUITY OF A DIABETIC PATIENT WHILE UNDERGOING TREATMENT

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Patient, age 51, female. This patient has been under my care for a presbyopic visual defect since 1926 when her first near-point correction was prescribed. At that time and again in 1929 when next seen, her distance visual acuity uncorrected was normal. In May of this year she again came in and though the media was clear, her distance visual acuity uncorrected was 20/100 and corrected with a pair of spherical —1.25 D lenses increased this visual acuity to only 20/32. This was the best visual acuity, lenses would give her at that time. I refused to prescribe these suggesting rather to refer her to her family physician, who has been treating her since for a diabetic condition. On August 2nd her uncorrected visual acuity was 20/24.

The above case apparently substantiates the theory of Duke-Elder who in the British Journal of Ophthalmology, Vol. IX, No. 4, pp. 167-187, 1925, claims that the refractive power of the eye tends to vary directly as the sugar content of the blood varies. His experiments lead him to believe that as the sugar content decreases, hyperopia tends to increase, and as the sugar content increases, hyperopia would decrease or the myopia would increase. He believes that these changes are due to an osmotic processes involving the lens caused by a variation of the molecular concentration of the blood and tissue-fluids with the sugar content.

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ORTHOPTIC TREATMENT WORK

From time to time during the past ten years the writer has suggested that greater stress be placed on the important matter of orthoptic treatment work in optometric practice. Far too many cases in my judgment are merely refracted and dismissed. Many patients are today suffering from uncorrected neuro-muscular defects simply because the optometrist or ophthalmologist who refracted them was too indifferent to prescribe not only the glasses but orthoptic treatments, which were indicated, as well.

Just why such a large group of refractionists ignore this splendid opportunity for constructive, practice building, profitable work remains somewhat of a mystery. To be sure, this treatment work to be done successfully requires certain knowledge. This knowledge, however, can be acquired at the Graduate Clinics of the various State Societies or it can be gotten at the mid-summer Graduate Courses now held annually at several of our large colleges.

The work itself is interesting and the good accomplished by orthoptic treatment work in certain cases is, of itself of such value to

the patient that these treatments must be incorporated into the armamentarium of every optometric practitioner.

Just at this time the announcement is made of a new treatment aid by the American Optical Company. This new instrument is called the Stereo Orthoptor. It combines in one instrument the means of building up ductions, increasing positive or negative fusional convergence, treating amblyopia ex anopsia, developing and increasing stereoscopic depth perception and rendering the versions more efficient. The new instrument itself is electrically operated, and so arranged that most ocular treatments may be given without continuous attendance and manipulation of the instrument by the practitioner. It would therefore be seen that this new treatment device incorporates many of the standard principles of ocular treatment work as outlined by Robinson, Sheard, Worth, Wells, Black, Savage and others.

The development of apparatus to assist the practitioner in treating his neuro-muscular cases indicates that various manufacturers are keenly aware of the need for this work. The Campimeter with its Fusion Training Cards; the Hazen Kratometer; the rotary prism; the Worth-Black Amblyoscope; the Wells Stereoscopic Fusion training Phorometer; the Squint Korector and Myoculator all point the way to these important optometric treatment technics, and the new Stereo Orthoptor again emphasizes the need for greater study and use of these important aids to normal comfortable vision. Those who furnish us with our equipment are doing their part in giving us the finest instruments available. Our schools and educational bodies are ever willing to cooperate. It is now up to the profession to use all of this splendid assistance and to give the public the fullest optometric service, which can only be rendered by means of orthoptic treatment work administered in certain cases where it will be of value. C. C. K.

BOOK NOTICE

THE NEW OPTOMETRY. T. J. Arneson, Opt.D. Published by the author, 920 Nicollet Ave., Minneapolis, Minn. 189 pages. Illustrated. $5.75. 1932.

The author of this book is also the inventor of an instrument called the *Squint Korector*. The sole purpose of the book is to assist users of this instrument and to interest other refractionists in the use of the instrument. The *Squint Korector* is fully described by Arneson and various technics are outlined by him as are his very unusual views on most everything refractive.

After reading his book one is sure that Arneson is certainly not led around by the theories and reasonings of others. For instance, having tried objective refractive tests and not having liked them, he has returned to the good old subjective ones, and based his entire refractive procedure on his test type and his trial case, and what is more, he makes no bones

of it. In fact, not once but several times does he stress this point in this new book of his. And too, this is not the only point at which his somewhat eccentric nature out-crops. The phoria test also comes in for its share of censure, and we are informed that it, as well as skiametry, is unreliable. On page 55 he informs us that he can easily make a diagnosis in one examination and throughout the book he is forever talking about *building muscles* through the exercises he advocates. In addition to this, he has produced a new terminology for some of the more commonly used terms thus adding somewhat to the eccentric characteristics of his work.

However, the foregoing are more or less minor faults. The author is a successful man and like most successful people, permits himself the luxury of being different. Therefore to him, refinements in refractive technic are so much bosh, to be brushed aside for the more important business of ocular exercise. Nevertheless, before proceeding to the good qualities of this book, and they are many, the reviewer must point out several glaring faults in the author's contribution. In the first place, Arneson claims, not once but several times (see pages 39, 74 and 93), that he is successful in entirely curing 80% of all squint cases which come to him. These complete cures he claims he is able to make by means of his non-surgical treatment technics. This statement, when viewed from the experience of other practitioners with similar technics sounds like exaggeration. In the second place he recommends these same treatments for nearly every ocular abnormality known to man. This smacks of quackery. It reminds one of the physical culture faddists who attempt to cure everything from dandruff to ingrown toe nails by means of exercise. In this the reviewer believes Arneson has gone too far. His instruments and his technic will no doubt improve the tone of many cases of phorias and tropias, but to recommend the ocular treatment of Glaucoma and Retinitis Pigmentosa and Cataract by optometrists with this device is to lay the entire profession open to ridicule. The author has, I believe, become over-enthusiastic and like many an other genius has let his enthusiasm for the wonderful work he has done, carry him beyond the normal technical limits of his chosen field.

So much, however, for the few faults in the book. In the main it is well written. It is interesting and decidedly easy reading. The literary style is one which carries the reader along from paragraph to paragraph with little effort. The author's belief and whole-hearted interest in his story is so evident and so sincere that even in reviewing the book the writer was from time to time carried away by his (Arneson's) enthusiasm. The following somewhat flowery extract from page 66 illustrates the style of the author's writing and enthusiasm.

> "In building Myo-Fusion Amplitudes we are transforming stiff, board-like muscles into elastic shock absorbers. With fusion so suspended it floats, as it were, in a cushion of air, supported from all angles somewhat as the law of gravity sustains the earth, thereby relieving the brain and nervous system of the ever present tension and shocks that break down nervous energy. Relief from

this tension and these mental shocks is necessary for complete equilibrium and relaxation. This condition of relaxed muscles is better accomplished with KORECTOR exercise than by any other means."

Arneson has written a hand book for the *Squint Korector*. It is not a scientific treatise nor a text book. It is merely a computation of his own views on the subject of ocular treatment work and a review of a series of rules which experience has taught him to be of value in using the instrument he has invented.

The book carries a preface in the nature of an article written about the author some two years ago by Dr. R. M. Peckham and the book closes with some thirty-odd pages of case reports. C. C. K.

ABSTRACTS

(ON MYOPIA)—A FEW CHECK TESTS. R. M. Peckham. The Optometric Weekly, Vol. 23, No. 24, pp. 670-672. 1932.

With reference to the correction of myopia Peckham says that if the addition of plus to the distance correction increases the abduction at near, such cases should be given bifocals. If the addition of plus to the distance correction does not increase the near abduction, bifocals are contra-indicated and should not be given. This means, of course, that the abduction test at near is to be taken first with the distance correction and then with different amounts of plus additions. That plus addition that gives the highest break and recovery in the near abduction test is the amount of plus that should be prescribed as a bifocal wafer.

—C. C. K.

ANNOTATIONS
AND
SOCIETY PROCEEDINGS

The American Journal of Optometry is the Official Organ of the American Academy of Optometry, as well as the Organ of the Arkansas, Delaware, Indiana, Iowa, Maine, Maryland, Michigan, Minnesota, Nebraska, North Dakota, Oklahoma, Pennsylvania, South Dakota, Vermont and West Virginia Optometric Associations.

The following gentlemen have consented to supply items of interest from their respective sections, acting in the capacity of

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FOUR HARMFUL INFLUENCES

The writer recently received a letter requesting him to state the four most harmful influences in or effecting optometry today. After some thought I have listed these four ills in the order in which they impress me as being most harmful to optometry as a profession.

1. The Backwards or Unprogressive Optometrist
2. The Merchant Optometrist
3. The Optometric Politician
4. The Dispensing Optometrist—(Not Optician)

It will be noted that in each case the evil exists within rather than without the profession itself. In other words, we are, it seems at least to me, our own worst enemies. Yet each of these faults can be corrected in time as I shall try and show later. First let us go into each of the above and briefly review present conditions with regard to these evils.

The Backwards or Unprogressive Optometrist

The backwards practitioner is one who, finding himself behind the times, because of his failure to study and keep abreast of them, sets up a loud protest at any and all changes and improvements in optometric practice and procedure. There are quite a few of these, and naturally so.

They are, in their present state, quite restless, spending most of their spare time writing letters protesting about the changes and improvements they do not understand, and telling the world about the good old days. As I will show later these fellows can and even now are being dragged from their complacent cocoons. Many of them will make real optometrists of themselves within the next few years.

The Merchant Optometrist

The Merchant Optometrist is one who is interested only in "moving" so much material in any given period of time. As a rule this chap is a price-cutter who is just as apt at juggling the quality of the material he prescribes as he is the price of it. While he makes a considerable noise, he is as a whole not respected by the public he serves and is never proud of his own work or the position he holds in society. He is a misfit in a profession which holds no future for him.

The Optometric Politician

The year in and year out Optometric Politician is one who must keep things in *status quo* for fear of losing his hold. This man fears *change* for he too is unprogressive, as he has no time for mental improvement due to having to spend all of his spare time keeping his political fences in order. There is a definite remedy for this evil as I shall show later.

The Dispensing Optometrist

The Dispensing Optometrist is one who is willing to sell his professional standing in the community for the sake of a few dollars. All dispensing other than ones own should be left to the optician, as no optometrist should so degrade himself as to fill a prescription written by another refractionist. Remember, we are professional men whose business it is to write prescriptions not to fill them. The material is unimportant, it is our professional skill as refractionists that justifies our existence and this is the fact that we must impress upon the public.

So much for the outstanding four harmful influences which beset the profession today. How can these be rectified? In what way can these harmful influences be corrected and changed if possible into assets to the profession? To take them in order let me first start with the Backward or Unprogressive Optometrist.

As I have already indicated steps have been taken through the Skeffington Graduate Clinic Plan and through the Alexander Zone Plan to round up, through a series of interesting meetings many of these men. Here they meet progressive optometrists and by the interchange of ideas many who were backwards are fast becoming progressive themselves. They move into professional quarters and having studied better technics in these graduate courses, they re-equip themselves and become worthy practitioners of optometry. These study groups of which there are now nearly 200 in the country will do much to awaken the interest of the unprogressive practitioner. It is a splendid work and should be encouraged in every possible way.

Regarding the Merchant Optometrist let me say that he is, in my belief without the pale of mental improvement. With his price cutting tactics, and his sole interest centered around the cash register bell, he seems impossible to change. As the public becomes more and more eye conscious, and more and more exacting as to whom shall prescribe for its visual defects, this fellow will find it harder and harder to hold his clientele. It is my belief that no one need to worry about these men. Normal evolutionary change will take care of them, and in most cases they will sink to the level now occupied by the advertising dentist.

I will now take up the "Optometric Politician." In many places the writer has found that one man or a small group of men have attached themselves to the organiaztion and frequently the State Board in their localities and by means of liberal doses of hot-air have succeeded in perpetuating themselves in office and power from year to year, chiefly it seems to satisfy their ego *for* power as these fellows rarely do anything or accomplish anything worth mentioning. They do, however, frequently bring their local societies to such a standstill through their self complacent attitude as to deadlock all possible chance for improvement. The remedy for this is obvious. Chuck these demagogues into the discard. Elect a new young set of officers and amend the by-laws thus prohibiting any officer from holding two terms. If there is any honor in being an officer of a professional society it should be passed around. No one individual has a monopoly of brains and we should note some improvement or at least some activity with each change of administration. This is an evil which can be entirely eradicated within a year and is a change which is very necessary in some areas.

As regards to the fourth harmful influence it seems superfluous to say more than has already been said. It is obvious, I believe that no professional man should stoop to fill another's prescription. He loses cast when he does and therefore injures himself. It is a habit that is fast dying out, and it is a harmful influence which should be stopped entirely wherever still practiced.

It can, therefore, be seen that in each case the future holds prospect, providing, of course, that all progressive professional optometrists do their individual part in eradicating these harmful influences by helping others wherever possible. C. C. K.

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MASSACHUSETTS STATE BOARD

The Massachusetts Board of Registration in Optometry will hold its next examination on November 28, 29 and 30, 1932, at the State House, Boston, Mass. Applications for examination should be on file at the office of the Secretary, Room 141, State House, at least ten days before date of examinations.

ANTHRACITE OPTOMETRIC ASSOCIATION

Dr. M. L. Blum, optometrist of Hazelton, Secretary of the Pennsylvania Optometric Association, announces that the Anthracite Optometric Association has been very active throughout the summer months, several educational meetings being held, the last dealing with Stereoscopic treatment work. He also informs us that Dr. J. C. Strauss, has called a final meeting of the Secretaries of all local societies to finish drafting a new Constitution for the State Association.

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BACK COPIES WANTED

We have received recently a number of requests for copies of the March, 1932, issue of the American Journal of Optometry. Our supply of this issue is completely exhausted—any of our readers who care to part with their March copy should write to The American Journal of Optometry, Circulation Department. We will pay the regular rate of forty cents per copy.

Also, The Dartmouth Medical School Library of Hanover, New Hampshire, is anxious to complete its files of the American Journal of Optometry and wish to secure the following back copies:—the complete Volumes 1, 2 and 3 and Nos. 1, 2, 3, 4, 5, 6, 7 and 8 of Volume 4. Any one of our readers caring to part with any of these copies should get in touch with Professor Gordon H. Gliddon at the above address.

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PENNSYLVANIA STATE COLLEGE

The announcement has been made that the Pennsylvania State College of Optometry has purchased nearly seven acres of ground for its new campus at 12th and Spencer Avenues in Philadelphia. This tract comprises about two city blocks and when completed will house one of the finest group of optometric buildings now in use at any of our colleges. There are two large school buildings on the campus at the present time as well as an athletic field suitable for football, baseball and track events. In addition to this there are twelve tennis courts and a swimming pool.

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HEISLER SPEAKS ON ADVERTISING

Mr. C. B. Heisler of the State Education Department of New York State in an address before the Annual Banquet of the New York Optometrical Association made the following remarks relative to advertising on the part of optometrists:

". . . You are professional practitioners just as much as the physician, dentist, and lawyer; and like them you must abide by a code of ethics that will put you above reproach, or you are a discredit to your profession. . . .

". . . What would any one of you think of a physician who would advertise blatantly in a newspaper that he would examine you free of charge and that he would

sell you an operation for some specified price! It seems to me that that is a good parallel. Why should he advertise a free examination? Simply to get you into his office with the expectation that before you get out he would do something for you for which he could make a charge. How could he promise you an operation at a specified price before he knew what kind of an operation you needed, if any? I may be wrong, but I do not believe that such a physician would long be tolerated in any community. The situation in Optometry is fundamentally the same. An Optometrist within the scope of his activities is just as much a trustee of the public health as a physician . . .

"I would like to see the time come when the Optometric profession would petition the Board of Regents to rescind these rules of the Board on advertising, since public opinion in the profession rendered them no longer necessary. Until that time comes all of you can do your part. Your local organization can make fraudulent advertisers pariahs and outcasts. If they persist, report them to the Department, and we will do the rest."

Here is the view of an outsider, who through his connections with the Board of Optometric Registration in New York is in a splendid position to view the harm which is done by these optometrists who have such poor taste as to advertise. Heisler's views on this important question merely substantiates the stand taken on individual advertising by all professions and serve to emphasize the position taken by this Journal against optometric advertising in any form whatsoever.

—C. C. K.

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PENNSYLVANIA ANNUAL CONVENTION

The Annual convention of the Pennsylvania Optometric Association will be held at Reading October 2nd to 5th. There will be five educational talks, an interesting exhibit, a Golf Tournament, and a Banquet and Dance, in addition to the usual business sessions of the Association.

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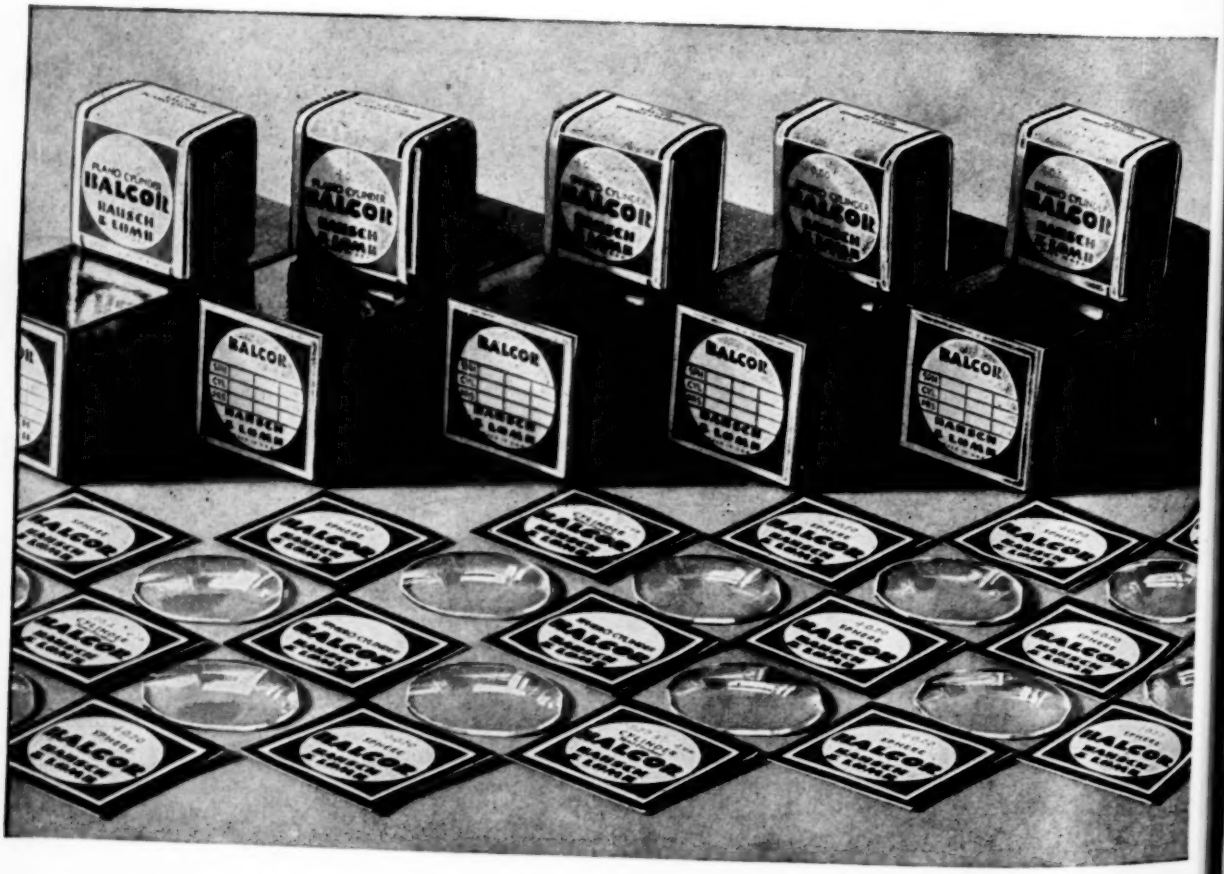
BIFOCAL FITTING FRAME

A new feature in trial frame construction has been introduced by the Anton Heilman Company of New York City. This new trial frame has a supplementary cell which holds a regular trial case lens in such position as to represent the wafer of a bifocal. The frame enables the optometrist to demonstrate the possibilities of bifocals to patients who have never used them, by simply using in this new frame, two or more trial case lenses before each eye.

A quality lens for

BALCOR

A fit running-mate for Orthogon